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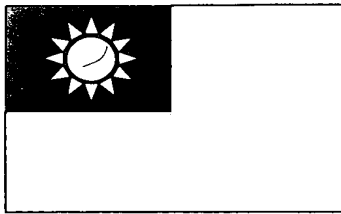
TRANSMITTAL FORM (to be used for all correspondence after initial filing)	Application Number	10/743,938	
	Filing Date	December 23, 2003	
	First Named Inventor	Lu Jing	
	Art Unit	Unknown	
	Examiner Name	Unknown	
Total Number of Pages in This Submission	460	Attorney Docket Number	A3-239 US

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MINISTRY OF ECONOMIC AFFAIRS
REPUBLIC OF CHINA

茲證明所附文件，係本局存檔中原申請案的副本，正確無訛，

其申請資料如下：

This is to certify that annexed is a true copy from the records of this office of the application as originally filed which is identified hereunder:

申請日：西元 2002 年 12 月 24 日
Application Date

(申請) 案號：091220979
Application No.

申請人：莫仕股份有限公司
Applicant(s)

局長
Director General

蔡練生

發文日期：西元 2004 年 1 月 16 日
Issue Date

發文字號：09320051920
Serial No.

申請日期：	IPC分類
申請案號：	

(以上各欄由本局填註)

新型專利說明書

一、 新型名稱	中 文	壓接式端子
	英 文	
二、 創作人 (共1人)	姓 名 (中文)	1. 陸景
	姓 名 (英文)	1. Lu Jing
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三、 申請人 (共1人)	名稱或 姓 名 (中文)	1. 美商莫仕股份有限公司
	名稱或 姓 名 (英文)	1. MOLEX INCORPORATED
	國 籍 (中英文)	1. 美國 US
	住居所 (營業所) (中 文)	1. 美國, 伊利諾州60532-1682里斯, 威靈頓區2222號 (本地地址與前向貴局申請者相同)
	住居所 (營業所) (英 文)	1. 2222 Wellington Court, Lisle, IL 60532-1682
	代表人 (中文)	1. 路易士. 耶. 賀特
	代表人 (英文)	1. LOUIS A. HECHT



四、中文創作摘要 (創作名稱：壓接式端子)

一種壓接式端子，包括有一套筒、一觸接元件及一彈性元件，該觸接元件設置於該套筒內部，並具有一接觸部，該彈性元件亦設置於該套筒內部，該彈性元件可頂推該觸接元件而使其接觸部彈性伸出該套筒前端；本創作主要係於套筒上設有一穿孔，使套筒在浸鍍時，套筒內部多餘的液體可順利的排除，使殘留液體減至最小，套筒內部電鍍均勻、完整，具有較佳的電鍍品質，使套筒具有較佳的導電性，且該穿孔在套筒浸鍍完成後以一塞塊密封，可防止雜質進入套筒內部。

伍、(一)、本案代表圖為：第二圖

(二)、本案代表圖之元件代表符號簡單說明：

1 0 套筒

1 1 穿孔

英文創作摘要 (創作名稱：)



四、中文創作摘要 (創作名稱：壓接式端子)

1 2 塞塊

2 1 接觸部

2 0 觸接元件

3 0 彈性元件

英文創作摘要 (創作名稱：)



一、本案已向

國家(地區)申請專利

申請日期

案號

主張專利法第一百零五條準用
第二十四條第一項優先權

無

二、☐主張專利法第一百零五條準用第二十五條之一第一項優先權：

申請案號：

無

日期：

三、主張本案係符合專利法第九十八條第一項☐第一款但書或☐第二款但書規定之期間

日期：



五、創作說明.(1)

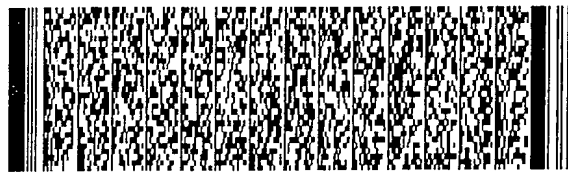
【 新型所屬之技術領域 】

本創作係有關於一種壓接式端子，尤指一種可作為測試接點的探針，或用於電性連接兩裝置之壓接式端子。

【 先前技術 】

請參閱第一圖，習知的壓接式端子，可作為測試接點的探針，或用於電性連接兩裝置。該壓接式端子包括有一套筒10a、一觸接元件20a及一彈性元件30a，該套筒10a係以金屬材料一體成型，其係呈中空柱狀，該套筒10a前端為開口狀，後端為封閉狀。該觸接元件20a亦以金屬材料製成，該彈性元件30a及該觸接元件20a係依序由該套筒10a前端置入該套筒10a內部，而後將該套筒10a前端予以鉚合使形成一突縮狀之開口11a，藉該突縮狀之開口11a將該觸接元件20a及該彈性元件30a定位於該套筒10a內部，且該觸接元件20a前端係穿過該開口11a，並藉由該彈性元件30a頂推而使該觸接元件20a前端彈性伸出該套筒10a前端。

在實際使用時，該套筒10a後端可利用表面黏著技術（SMT）或穿孔（through hole）方式固定並電性連接於一電路板上，該觸接元件20a前端則可壓接於欲進行測試的接點上，使該接點上的訊號可傳遞至電路板上，藉此進行測試的工作。另，該套筒10a後端亦可電性連接於一裝置，且將該觸接元件20a前端壓接於另一裝置，藉此達成該兩裝置電性連接的作用。



五、創作說明 (2)

惟，上述習知的壓接式端子，其用於電路探測時，套筒需具有較佳的導電性，因此需於套筒上鍍一層導電性較佳的鍍金，藉以加強導電性。套筒的鍍金製程一般係採用浸鍍的方式，但由於套筒僅有前端的開口狀，其他部份為封閉狀，因此在浸鍍時，套筒內部的液體無法對流，使得套筒內部液體不易流出，造成套筒內部電鍍不均勻，且會殘留液體，易造成電鍍品質不佳，嚴重的影響套筒的導電性。

是以，由上可知，上述習知的壓接式端子，在生產製造及實際使用上，顯然具有不便與缺失存在，而可待加以改善者。

緣是，本創作人有感上述缺失之可改善，乃特潛心研究並配合學理之運用，終於提出一種設計合理且有效改善上述缺失之本創作。

【新型內容】

本創作之主要目的，在於可提供一種壓接式端子，其套筒在浸鍍時，套筒內部多餘的液體可順利的排除，使殘留液體減至最小，套筒內部電鍍均勻、完整，具有較佳的電鍍品質，使套筒具有較佳的導電性。

為了達成上述之目的，本創作係提供一種壓接式端子，包括：一套筒，其前端為開口狀，該套筒上設有一穿孔，該穿孔在套筒浸鍍完成後以一塞塊密封；一觸接元件，其設置於該套筒內部，並具有一接觸部；以及一彈性元件，其設置於該套筒內部，且位於該觸接元件後方，該彈性

五、創作說明 (3)

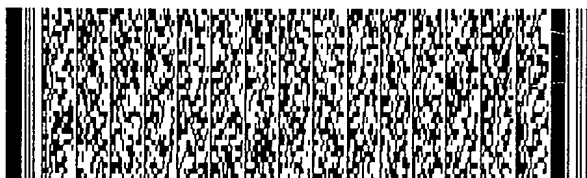
元件係頂推該觸接元件而使其接觸部彈性伸出該套筒前端。

為使能更進一步瞭解本創作之特徵及技術內容，請參閱以下有關本創作之詳細說明與附圖，然而所附圖式僅提供參考與說明用，並非用來對本創作加以限制者。

【實施方式】

請參閱第二圖、第三圖、第四圖及第五圖，本創作係提供一種壓接式端子，包括有第一套筒10、一觸接元件20及一彈性元件30，該套筒10係以金屬材料一體成型，其係呈中空柱狀，該套筒10前端為開口狀，後端為封閉狀。該套筒10後端可利用插接方式固定於電路板上所預設之穿孔（圖略）中，而以穿孔（through hole）方式固定於電路板上，或利用表面黏著技術（SMT）焊接固定於電路板上，使該套筒10得以固定及電性連接於該電路板上。

該套筒10上設有一穿孔11，該穿孔11係設於套筒10上之側緣或後端等任意位置，本實施例係將該穿孔11設於套筒10之側緣，該穿孔11在套筒10浸鍍完成後需配合一相對應之塞塊12予以密封。本創作之穿孔11及塞塊12的形狀並不限定，除了可設計呈「T」字型（如第二圖及第五圖）外，亦可設計呈圓柱型（如第六圖）、圓錐型（如第七圖）或「工」字型（如第八圖），該塞塊12係以緊配合、鉚接或螺接等方式固定於穿孔11中，將該穿孔11予以密封。



五、創作說明 (4)

該觸接元件20亦以金屬材料製成，其外徑係與該套筒10內徑相等，該觸接元件20係活動自如的配合於該套筒10內部，該觸接元件20前端具有一外徑較小之接觸部21。該觸接元件20係設置於該套筒10內部，且該觸接元件20之接觸部21可穿過該套筒10前端而伸出於外部。

該彈性元件30係為一壓縮彈簧，該彈性元件30係設置於該套筒10內部，且位於該觸接元件20後方。當該彈性元件30及該觸接元件20先後置入該套筒10內部後，則可將該套筒10前端予以鉚合使形成一突縮狀之開口13，藉該突縮狀之開口13將該觸接元件20及該彈性元件30定位於該套筒10內部，且該觸接元件20之接觸部21可穿過該開口13，該觸接元件20可藉由該彈性元件30頂推而使之前端之接觸部21彈性伸出該套筒10前端；藉由上述之組成以形成本創作之壓接式端子。

另，請參閱第九圖、第十圖、第十一圖及第十二圖，本實施例係將該穿孔11設於套筒10後端，如此該套筒10前端及後端均為開口狀，可獲得最佳的對流效果。在本較佳實施例中該穿孔11內設有凸緣110而呈「工」字型，該塞塊12在套筒10浸鍍完成後配合於該套筒10後端穿孔11中，且自兩端鉚合夾固凸緣110。

本創作主要係於該套筒10上設有一穿孔11，使該套筒10除了前端原有的開口外，另具有一增加對流效果



五、創作說明 (5)

的孔洞，如此套筒10在浸鍍時，套筒10內部多餘的液體可順利的排除，使殘留液體減至最小，套筒10內部電鍍均勻、完整，不會有殘留液體，具有較佳的電鍍品質，套筒10可具有較佳的導電性。再者，在套筒10浸鍍完成後，並以一塞塊12將穿孔11密封，可防止雜質進入套筒10內部。

綜上所述，本創作實可改善習知壓接式端子，其在浸鍍時，套筒內部的液體無法對流，造成套筒內部電鍍不均勻，會有殘留液體，造成電鍍品質不佳，影響套筒導電性等問題，誠為一不可多得之新型創作產品，極具產業上利用性、新穎性及進步性，完全符合新型專利申請要件，爰依專利法提出申請，敬請詳查並賜准本案專利，以保障創作者之權益。

惟以上所述僅為本創作之較佳可行實施例，非因此即拘限本創作之專利範圍，故舉凡運用本創作說明書及圖式內容所為之等效結構變化，均同理皆包含於本創作之範圍內，合予陳明。

圖式簡單說明

【圖式簡單說明】

- 第一圖係習知壓接式端子之剖視圖。
第二圖係本創作第一實施例之立體分解圖。
第三圖係本創作第一實施例之立體組合圖。
第四圖係本創作第一實施例之平面圖。
第五圖係第四圖之 5-5 剖視圖。
第六圖係本創作第二實施例之剖視圖。
第七圖係本創作第三實施例之剖視圖。
第八圖係本創作第四實施例之剖視圖。
第九圖係本創作第五實施例之立體分解圖。
第十圖係本創作第五實施例之立體組合圖。
第十一圖係本創作第五實施例之平面圖。
第十二圖係第十一圖之 12-12 剖視圖。

【元件代表符號】

[習知]

- 1 0 a 套筒
1 1 a 開口
2 0 a 觸接元件
3 0 a 彈性元件

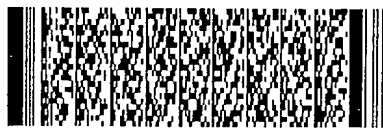
[本創作]

- 1 0 套筒
1 1 穿孔
1 2 塞塊



圖式簡單說明

1 3 開口
2 0 觸接元件
2 1 接觸部
3 0 彈性元件



六、申請專利範圍

1、一種壓接式端子，包括：

一套筒，其前端為開口狀，該套筒上設有一穿孔，該穿孔在套筒浸鍍完成後以一塞塊密封；

一觸接元件，其設置於該套筒內部，並具有一接觸部；以及

一彈性元件，其係設置於該套筒內部，且位於該觸接元件後方，該彈性元件係頂推該觸接元件而使其接觸部彈性伸出該套筒前端。

2、如申請專利範圍第1項所述之壓接式端子，其中該套筒後端為封閉狀。

3、如申請專利範圍第1項所述之壓接式端子，其中該套筒前端形成一突縮狀之開口，藉該突縮狀之開口將該觸接元件及該彈性元件定位於該套筒內部，該觸接元件之接觸部係穿過該開口而伸出該套筒前端。

4、如申請專利範圍第1項所述之壓接式端子，其中該穿孔係設於該套筒側緣。

5、如申請專利範圍第1項所述之壓接式端子，其中該穿孔係設於該套筒後端。

6、如申請專利範圍第1項所述之壓接式端子，其中該穿孔及該塞塊係呈「T」字型、圓柱型、圓錐型或「工」字型。

7、如申請專利範圍第1項所述之壓接式端子，其中該觸接元件外徑係與該套筒內徑相等，該觸接元件係活動自如的配合於該套筒內部。

第 1/12 頁



第 2/12 頁



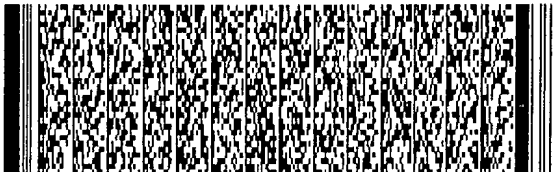
第 3/12 頁



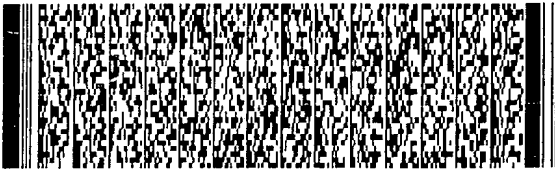
第 4/12 頁



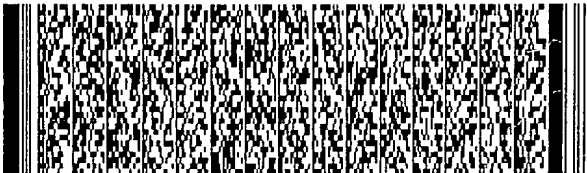
第 5/12 頁



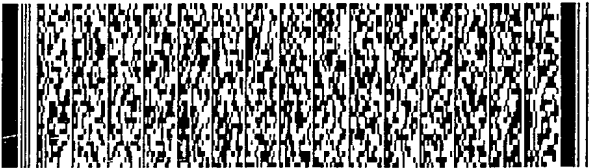
第 5/12 頁



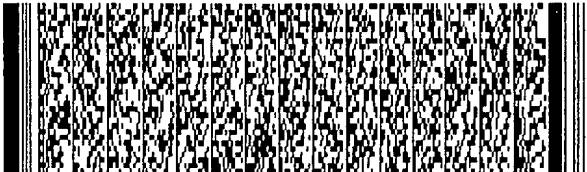
第 6/12 頁



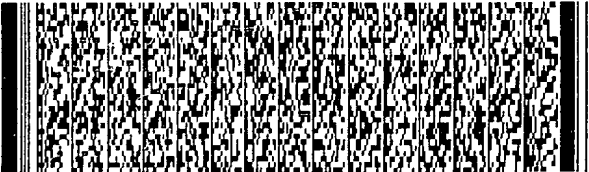
第 6/12 頁



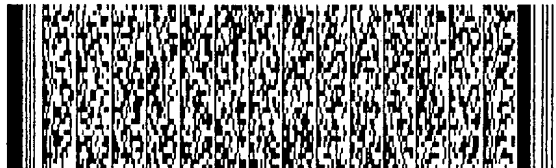
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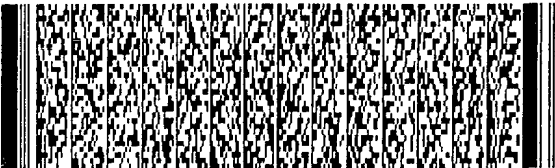
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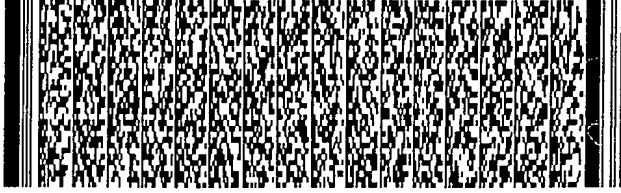


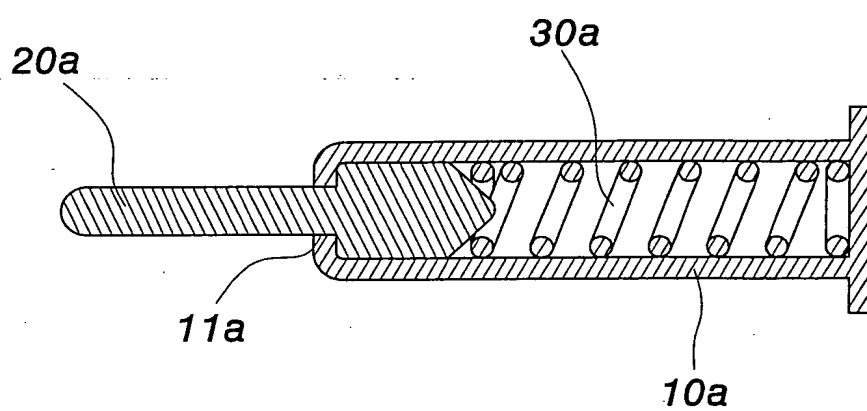
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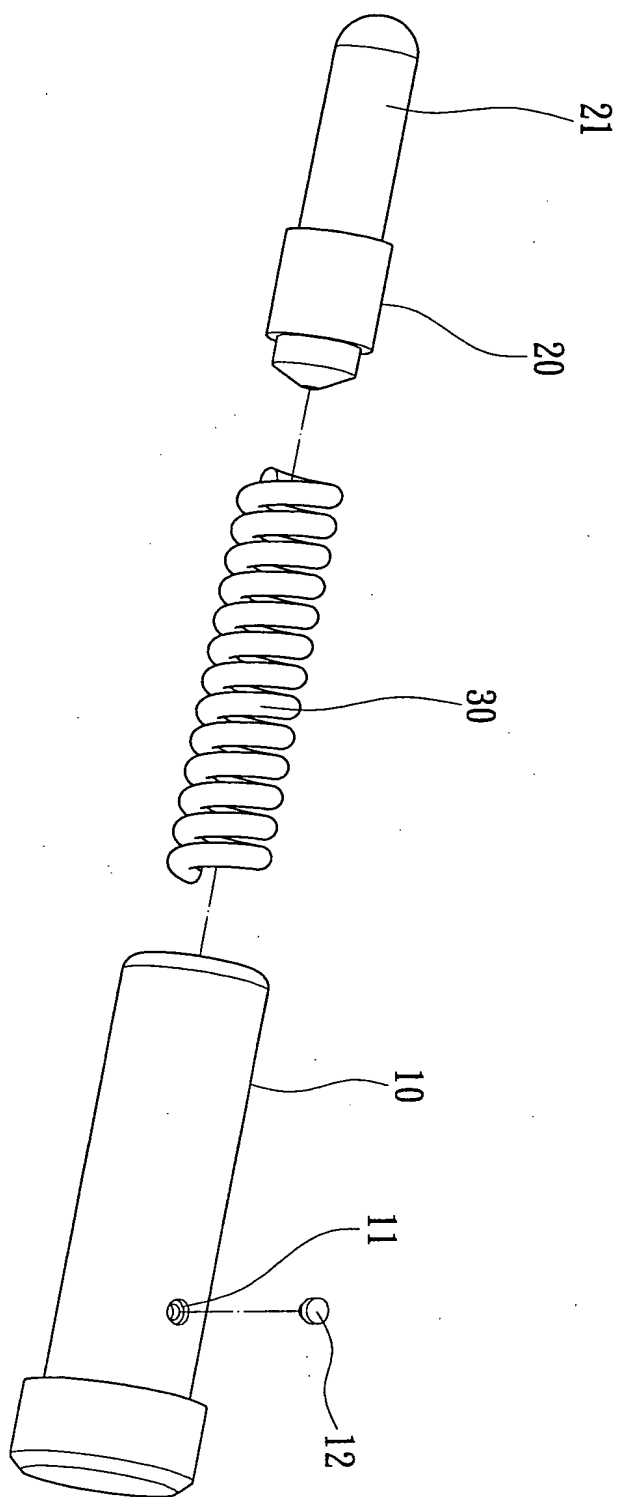
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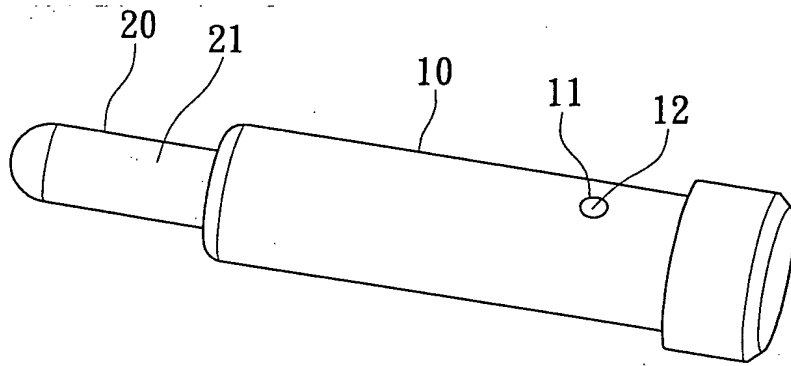




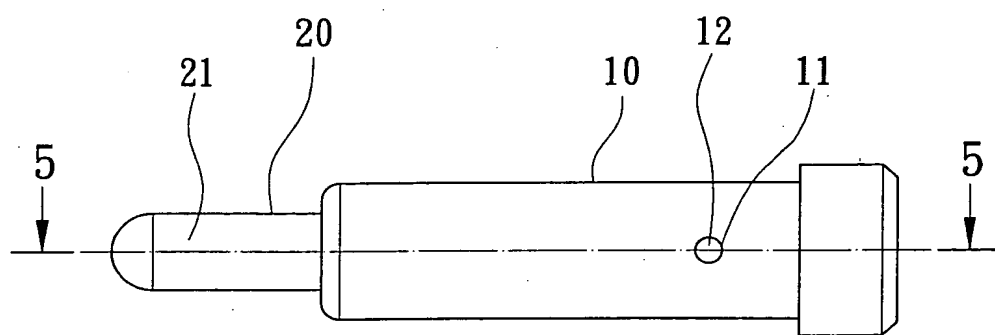
第一圖



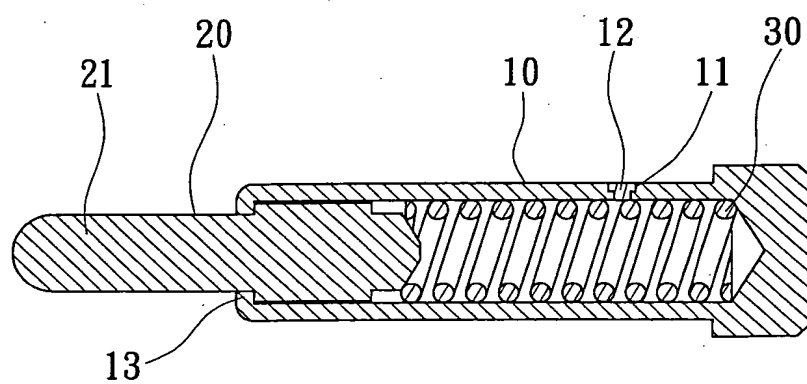
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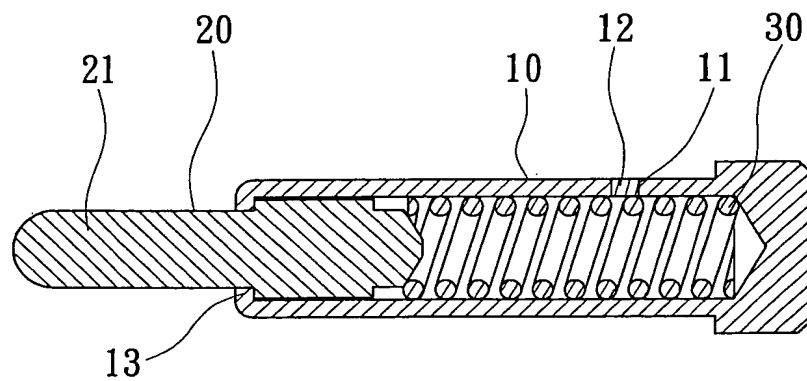
第三圖



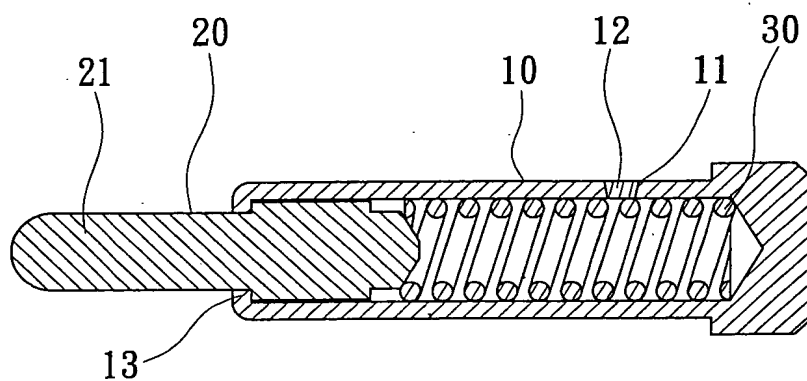
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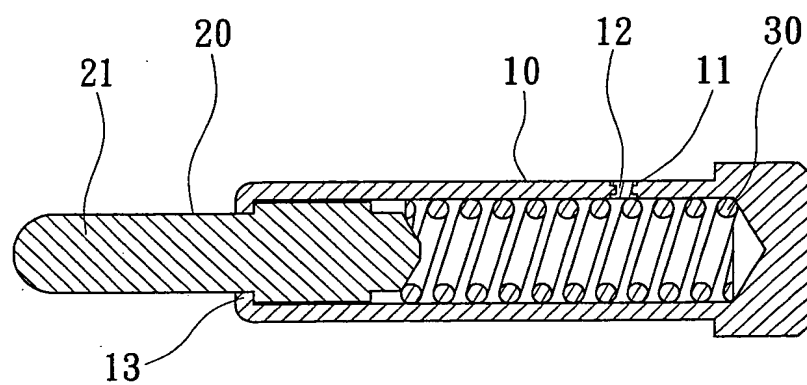
第五圖



第六圖

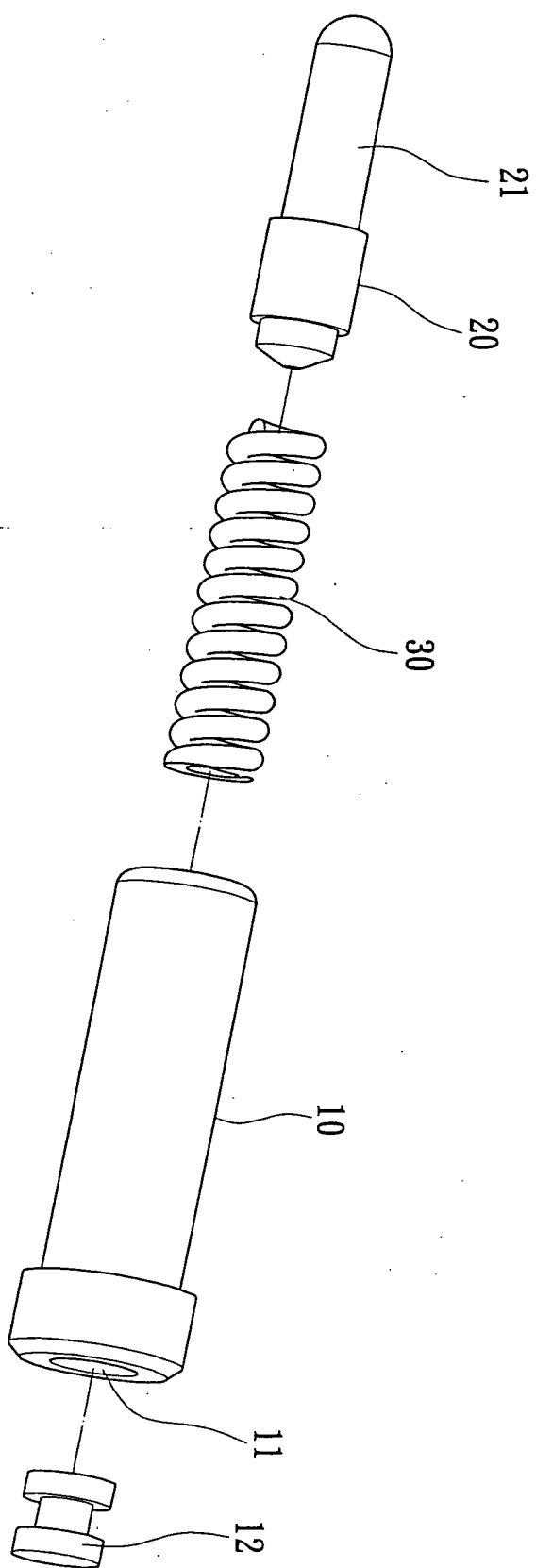


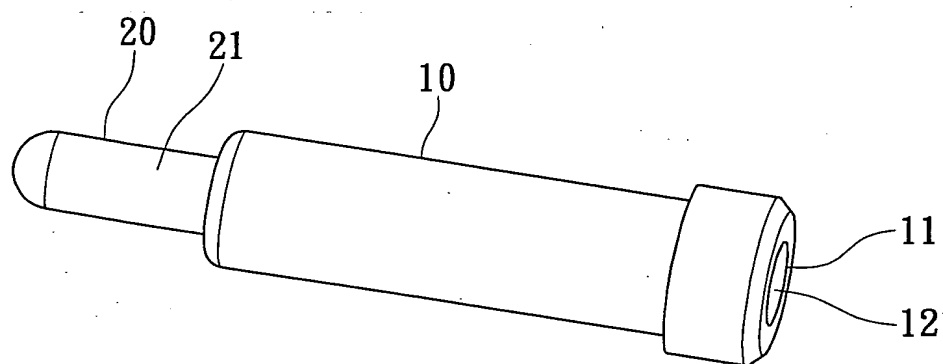
第七圖



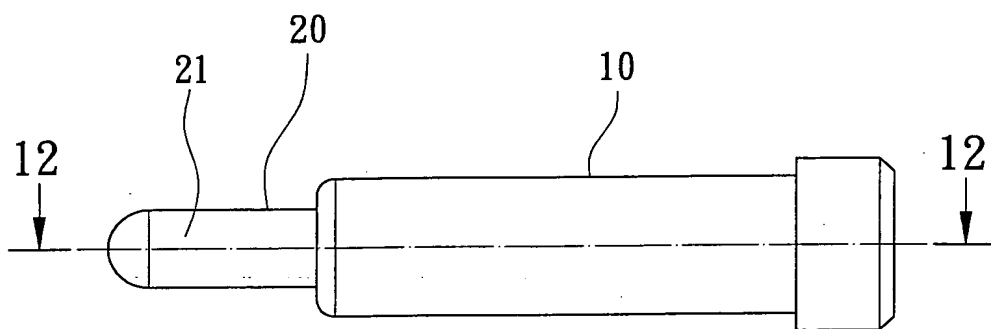
第八圖

第九圖

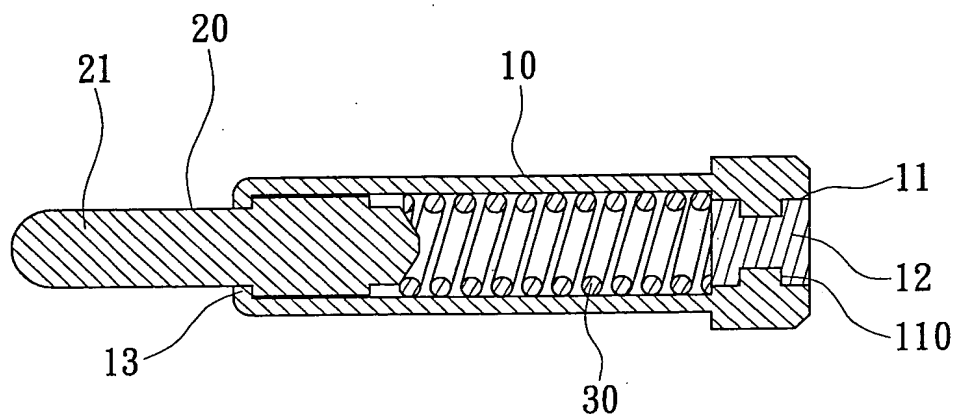




第十圖



第十一圖



第十二圖

A F F I D A V I T

I, Jan Lai being duly sworn, depose and say:

That I am thoroughly conversant with the Chinese and English languages, that I have carefully read the attached translation and compared same with original document in Chinese language (the application number 91220979), that said translation is a true and correct version of such original, to the best of my knowledge and belief.

My name and post office address are as stated below:

Full name of translator: Jan Lai

Signature of translator:

Jan Lai

Post office address: 2F, No. 6, Section 2, Hsing-Lung Rd., Wen Shan Dist., Taipei, Taiwan, R.O.C.

Date: November 28, 2003

Taiwan Patent App. No.	91220979
Filing Date	DEC. 24, 2002
Molex Ref.	A3-239 UM TW
Lien-Cheng Ref.	91P00992

Title of Invention		PIEZOELECTRIC TERMINAL
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	Nationality	U. S. A.
	Representative	Louis A. Hecht

PIEZOELECTRIC TERMINAL

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a piezoelectric terminal and, more particularly to a piezoelectric terminal defined as a contact probe for forming an electrical interconnection or providing an electrical contact between two devices.

2. Description of the Related Art

10 With reference to FIG. 1, a conventional piezoelectric terminal can be defined as a contact probe for forming an electrical interconnection or providing an electrical contact between two devices. The piezoelectric terminal generally includes a barrel 10a, a contact element 20a and an elastic element 30a. The barrel 10a is integrally formed by a metallic material and as a hollow shape. The barrel 10a has an open shape at its front end and a closed shape at its rear end.
15 The contact element 20a is formed by a metallic material. The elastic element 30a and the contact element 20a are sequentially placed into the barrel 10a from the front end of the barrel 10a. Then, the front end of the barrel 10a is riveted as a reduced opening 11a. Furthermore, through the reduced opening 11a, the
20 contact element 20a and the elastic element 30a are located in an inner of the barrel, and a front end of the contact element 20a passes through the reduced opening 11a. The elastic element 30a pushes against the contact element 20a, so that the front end of the contact element 20a is elastically extended out the front end of the barrel 10.

In actually using, the rear end of the barrel 10a can be fastened and electrically connected to a printed circuit board by means of a surface mount technology (SMT) manner or through hole manner. The front end of the contact element 20a can be pressed against on a contact that is further testing, so that
5 signal of the contact can be transmitted to the printed circuit board for proceeding to a testing work. Another, the rear end of the barrel 10a can be electrically connected to testing equipment, and the front end of the contact element 20a will be pressed against to an electrical device, thereby to achieve to a electrical contact between the testing equipment and the electrical device.

10 However, in circuit probing, the barrel of the conventional piezoelectric terminal needs to have a better conductivity, hence it must have a layer of gold plated on the barrel to raise the conductivity. The gold-plated process generally used to an immersion plating manner. But the open shape is only formed on the front end of the barrel, and the other portion of the barrel is of a closed shape.
15 Furthermore, in the immersion plating manner, the inner portion of the barrel fails to provide a convectional effect, so that the liquid in the inner portion of the barrel will be uneasy to flow out, and it will generate no uniform electroplate at the inner portion of the barrel and have the remaining liquid to bring about worse electroplate quality and seriously influence the conductivity of the barrel.

SUMMARY OF THE INVENTION

20 It is therefore a principal object of the invention to provide a piezoelectric terminal that can enable the superfluous liquid within the barrel to eliminate smoothly and reduce the remaining liquid to be less. Furthermore, it

will obtain uniform and complete electroplate effect at an inner portion of the barrel, and it will provide a better electroplate quality to generate a better conductivity due to the barrel.

To achieve the above object, the present invention provides a piezoelectric terminal includes a barrel, a contact element and an elastic element. The barrel has an open shape at a front end thereof, a through hole and a stopper sealed into the through hole after the barrel is in an immersion plating. The contact element is arranged within the barrel. The contact element has a contact portion. The elastic element is arranged within the barrel and positioned at a rear of the contact element. The elastic element pushes against the contact element, so that the contact portion is elastically extended out the front end of the barrel.

To provide a further understanding of the invention, the following detailed description illustrates embodiments and examples of the invention, this detailed description being provided only for illustration of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings included herein provide a further understanding of the invention. A brief introduction of the drawings is as follows:

FIG. 1 is a cross-sectional view of a piezoelectric terminal of a prior art;

FIG. 2 is a perspective exploded view of a piezoelectric terminal in accordance with a first embodiment of the present invention;

FIG. 3 is a perspective view of the piezoelectric terminal in accordance with a first embodiment of the present invention;

FIG. 4 is a plan view of the piezoelectric terminal in accordance with a first embodiment of the present invention;

FIG. 5 is a cross-sectional view of FIG. 4 along the line 5-5.

FIG. 6 is a cross-sectional view of the piezoelectric terminal in accordance with a second embodiment of the present invention;

FIG. 7 is a cross-sectional view of the piezoelectric terminal in accordance with a third embodiment of the present invention;

FIG. 8 is a cross-sectional view of the piezoelectric terminal in accordance with a fourth embodiment of the present invention;

FIG. 9 is a perspective exploded view of the piezoelectric terminal in accordance with a fifth embodiment of the present invention;

FIG. 10 is a perspective view of the piezoelectric terminal in accordance with a fifth embodiment of the present invention;

FIG. 11 is a plan view of the piezoelectric terminal in accordance with a fifth embodiment of the present invention; and

FIG. 12 is a cross-sectional view of FIG. 11 along the line 12-12.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Wherever possible in the following description, like reference numerals will refer to like elements and parts unless otherwise illustrated.

Referring to FIGS. 2-5, in one embodiment, a piezoelectric terminal of the present invention includes a barrel 10, a contact element 20 and an elastic element 30. The barrel 10 is integrally formed by a metallic material and as a

hollow shape. The barrel 10 has an open shape at its front end and a closed shape at its rear end. The rear end of the barrel 10 is fastened into a through hole (not shown) previously formed on a printed circuit board, or is welded on a printed circuit board by means of a surface mount technology (SMT), so that the
5 barrel 10 can be electrically connected to the printed circuit board.

In this embodiment, the barrel 10 has a through hole 11 formed on a circumference thereof. The present invention provides a stopper 12 to seal the through hole 11 after the barrel is in an immersion plating. The through hole 11 and the stopper 12 each have various shaped designs, such as a T shape (shown
10 in FIGS. 2 and 5), a cylindrical shape (shown in FIG. 6), a cone shape (shown in FIG. 7) and I shape (shown in FIG. 8). The stopper 12 is fixed into the through hole 11 to seal by means of a tight fitting manner, a riveting manner and a screwing manner.

The contact element 20 is made of a metallic material. Further, an
15 external diameter of the contact element 20 is equal to an internal diameter of the barrel 10, and the contact element 20 is movably mating within the barrel. The contact element 20 has a contact portion 21 defining a smaller diameter at a front end thereof. The contact element 20 is arranged in an inner portion of the barrel 10, and the contact portion 21 of the contact element 20 can pass through
20 the front end of the barrel 10 to extend out an outer portion of the barrel 10.

The elastic element 30 is a compression spring arranged within the barrel 10 and positioned at a rear of the contact element 20. The elastic element 30 and the contact element 20 are sequentially placed into the barrel 10 from the front end of the barrel 10. Then, the front end of the barrel 10 is riveted as a reduced

opening 13. Furthermore, through the reduced opening 13, the contact element 20 and the elastic element 30 are located in the inner portion of the barrel 10, and the contact portion 21 of the contact element 20 can pass through the reduced opening 13. The elastic element 30 pushes against the contact element 20, so that the contact portion 21 is elastically extended out the front end of the barrel 10.

Referring to FIGS. 9-12, in another embodiment, the through hole 11 is formed on a rear end of the barrel 10, so that the barrel 10 has two openings formed on the front end and rear end to generate the better convectional effect.

The barrel 10 of the present invention provides a flange 110 formed in the through hole 11 having a I shape. The stopper 12 is mated with the through hole 11 of the barrel 10 after the barrel is in an immersion plating, and two ends of the stopper 12 are riveted to clamp the flange 110.

In a main feature of the present invention, the through hole 11 is formed on the barrel 10 and according to the opening formed at the front end of the barrel 10 to add a convectional effect. Thus, in the immersion plating of the barrel 10, the superfluous liquid within the barrel 10 can be eliminated smoothly, and to reduce the remaining liquid to be less. Furthermore, it will obtain uniform and complete electroplate effect at the inner portion of the barrel 10, and it will provide a better electroplate quality to obtain a better conductivity due to the barrel 10. In addition, the stopper 12 can seal the through hole 11 after the barrel is in the immersion plating to prevent impurity from entering the inner portion of the barrel 10.

There has thus been described a new, novel and heretofore unobvious piezoelectric terminal which eliminates the aforesaid problem in the prior art. Furthermore, those skilled in the art will readily appreciate that the above description is only illustrative of specific embodiments and examples of the invention. The invention should therefore cover various modifications and variations made to the herein-described structure and operations of the invention, provided they fall within the scope of the invention as defined in the following appended claims.

WHAT IS CLAIMED IS:

1. A piezoelectric terminal comprising:

a barrel having an open shape at a front end thereof, and the barrel having
a through hole and a stopper sealed into the through hole after the barrel is in an
5 immersion plating;

a contact element arranged within the barrel, and the contact element
having a contact portion; and

an elastic element arranged within the barrel and positioned at a rear of
the contact element, and the elastic element pushing against the contact element,
10 so that the contact portion is elastically extended out the front end of the barrel.

2. The piezoelectric terminal of claim 1, wherein the barrel has a closed
shape at a rear end thereof.

3. The piezoelectric terminal of claim 1, wherein the barrel has an
reduced opening at the front end thereof, the contact element and the elastic
15 element are located in an inner of the barrel, and the contact portion of the
contact element passes through the reduced opening and extends out the front
end of the barrel.

4. The piezoelectric terminal of claim 1, wherein the through hole is
formed on a circumference of the barrel.

20 5. The piezoelectric terminal of claim 1, wherein the through hole is
formed on a rear end of the barrel.

6. The piezoelectric terminal of claim 1, wherein the through hole has a
shape selected from the group consisting of a T shape, a cylindrical shape, a
cone shape and I shape.

7. The piezoelectric terminal of claim 1, wherein the stopper has a shape selected from the group consisting of a T shape, a cylindrical shape, a cone shape and I shape.

8. The piezoelectric terminal of claim 1, wherein an external diameter of
5 the contact element is equal to an internal diameter of the barrel, and the contact element is movably mating within the barrel.

ABSTRACT

A piezoelectric terminal includes a barrel, a contact element and an elastic element. The contact element is arranged within the barrel. The contact element has a contact portion. The elastic element is arranged within the barrel.

5 The elastic element pushes against the contact element, so that the contact portion is elastically extended out the front end of the barrel. Furthermore, the barrel has through hole formed thereon. In an immersion plating of the barrel, the superfluous liquid within the barrel can be eliminated smoothly, and to reduce the remaining liquid to be less. Thus, the barrel will obtain uniform and
10 complete electroplate quality to generate a better conductivity. And a stopper can seal the through hole after the barrel is in the immersion plating to prevent impurity from entering the inner portion of the barrel.

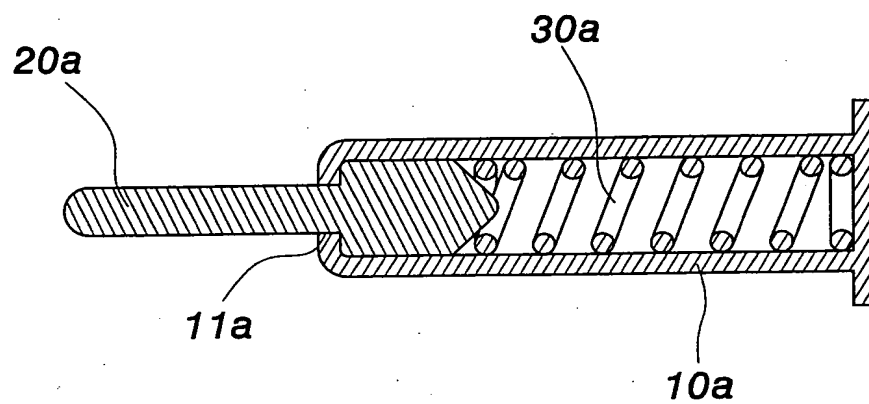


FIG. 1
PRIOR ART

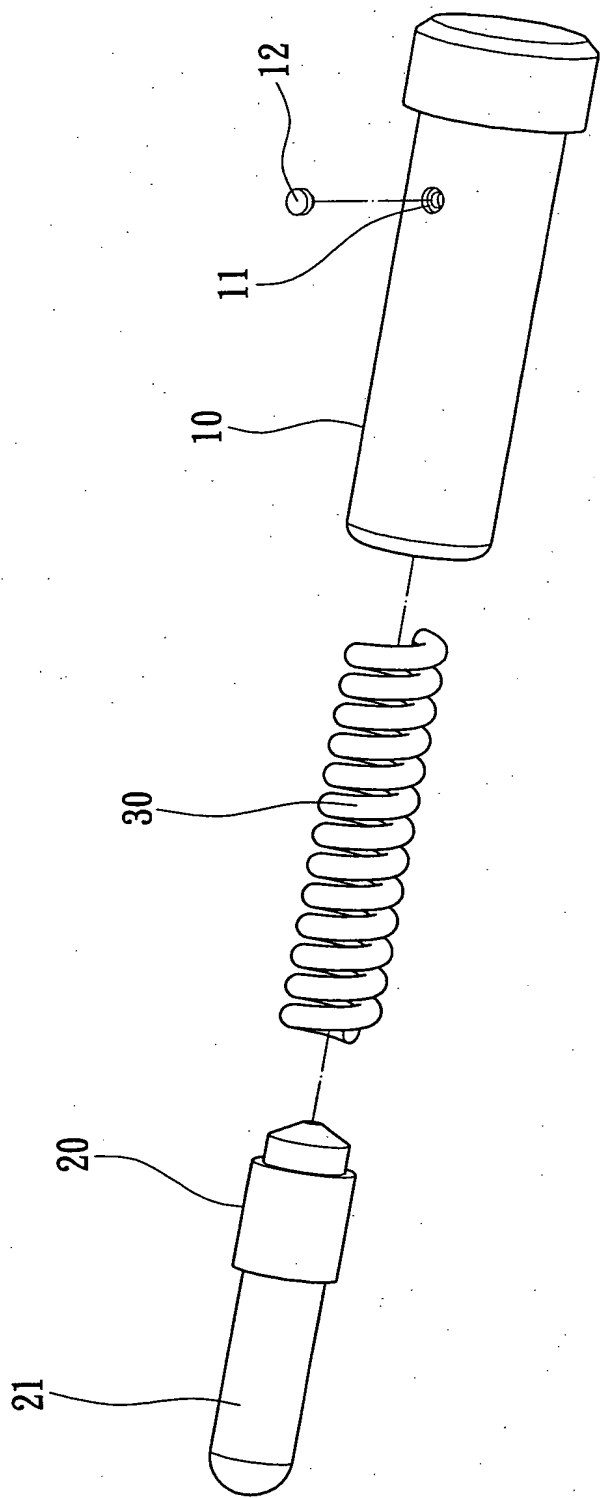


FIG. 2

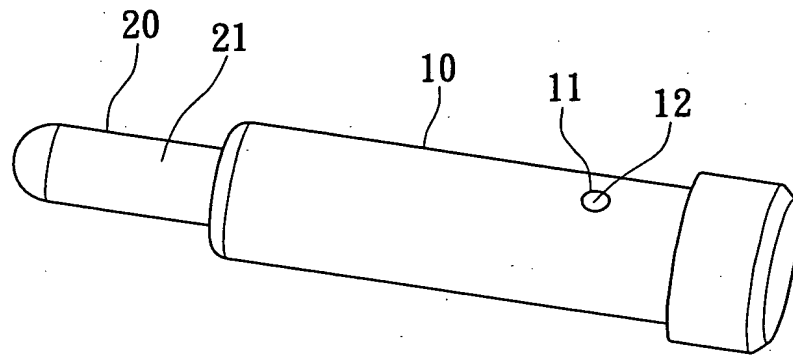


FIG. 3

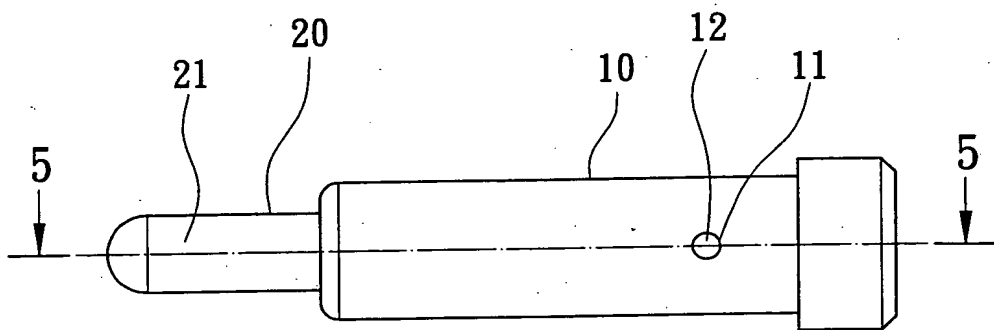


FIG. 4

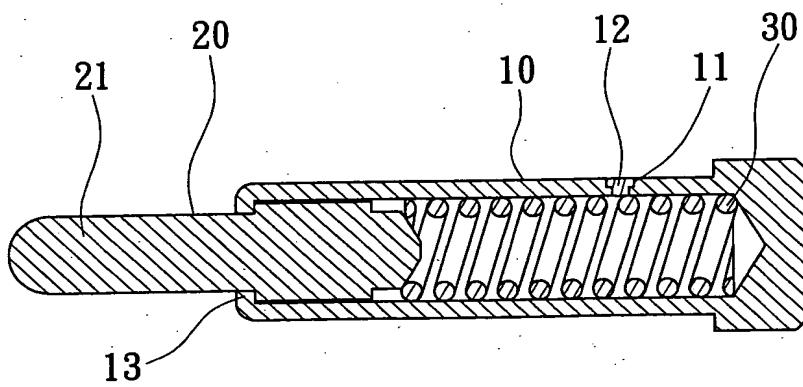


FIG. 5

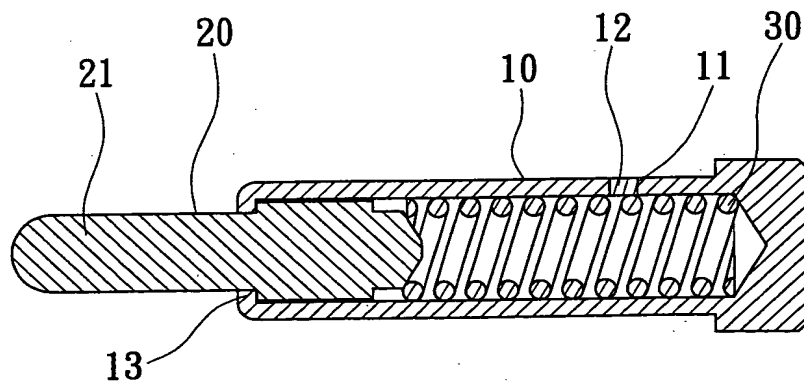


FIG. 6

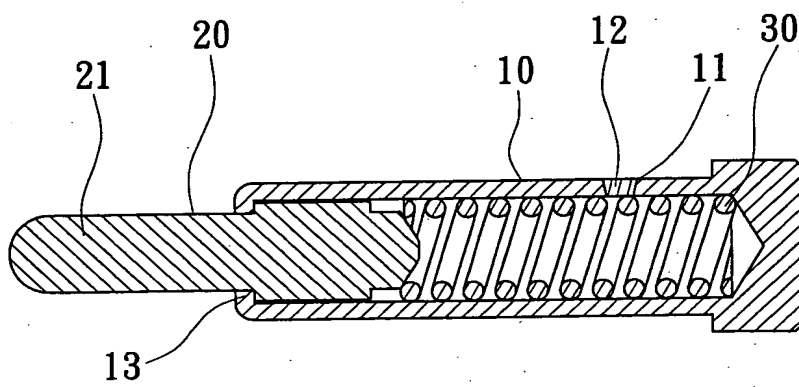


FIG. 7

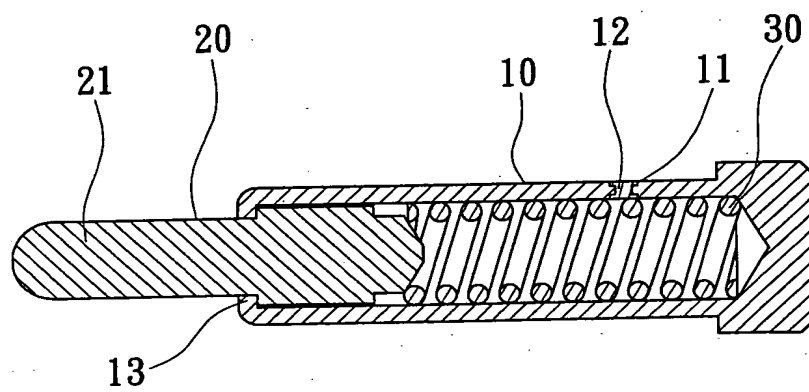


FIG. 8

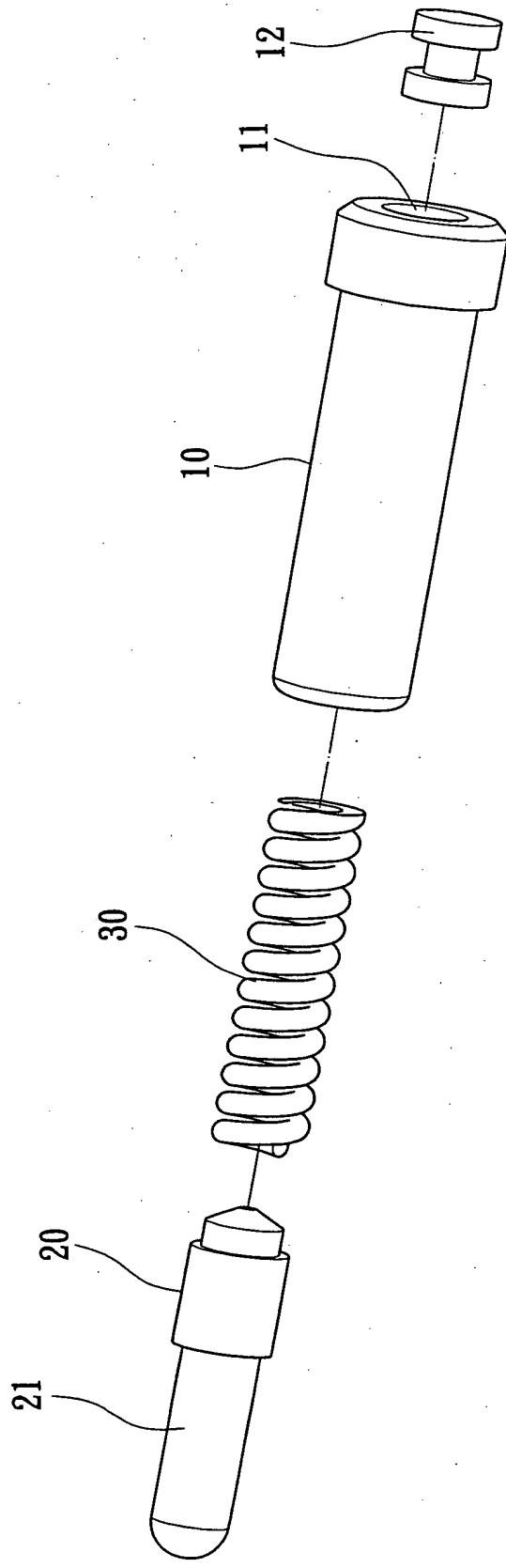


FIG. 9

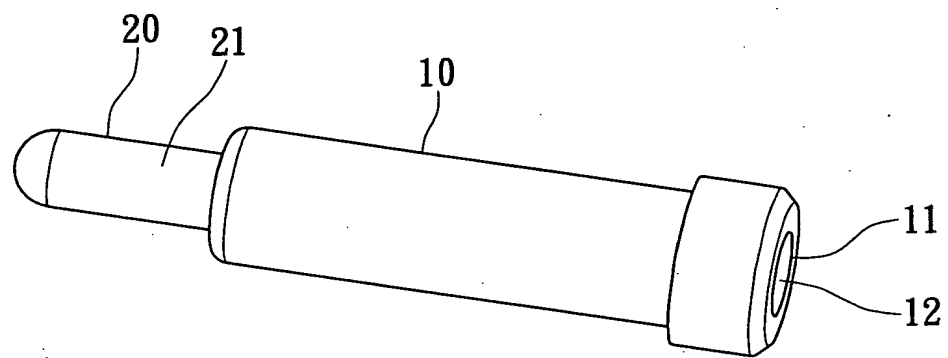


FIG. 10

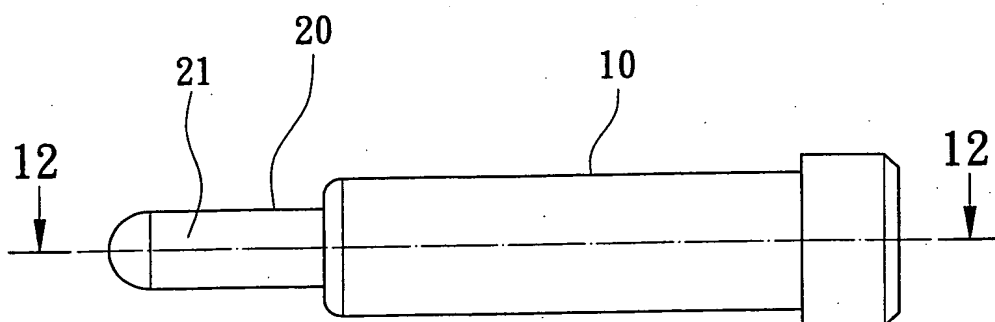


FIG. 11

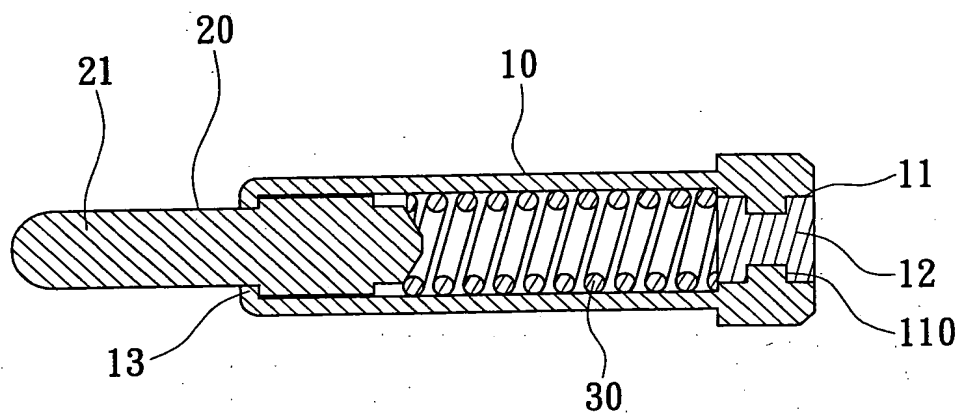


FIG. 12